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S O L A R S Y S T E M

Lab to assist on comet mission

Contour prepares for July 1 launch



JPL's Dr. Don Yeomans, Contour science team co-investigator.

et to visit and study at least two comets, NASA's Comet Nucleus Tour (Contour) should provide the first detailed look at the differences between these primitive building blocks of the solar system, and answer questions about how comets act and evolve. The mission is being prepared for a July 1 launch from Kennedy Space Center.

JPL will provide navigation and Deep Space Network support for the mission, and JPL astronomer Dr. Don Yeomans, manager of NASA's Near Earth Objects Program Office, is a Contour science team co-investigator.

Contour is scheduled to lift off on a three-stage Boeing Delta II expendable launch vehicle during a 25-day launch window that opens July 1 at 2:56 a.m. Eastern time. The spacecraft will orbit Earth until Aug. 15, when it should fire its main engine and enter a comet-chasing orbit around the sun.

Contour's flexible four-year mission plan includes encounters with comets Encke, Nov. 12, 2003, and Schwassmann-Wachmann 3, June 19, 2006. Contour will examine each comet's "heart," or nucleus, which scientists believe is a chunk of ice and rock, often just a few kilometers across and hidden from Earth-based telescopes beneath a dusty atmosphere and long tail.

"The Contour mission will be NASA's second mission dedicated solely to exploring these largely unknown members of our solar system," said Dr. Colleen Hartman, director of the Solar System Exploration Division at NASA Headquarters in Washington. "Contour joins our other operating mission, Stardust, which is on its way to bring a sample of a comet back to Earth, and Deep Impact will launch next year. These missions all help us find answers to the fundamental questions of how our planet may have formed and evolved, and how life may have begun on Earth and perhaps elsewhere in the Universe."

Comets are "the remnants of the outer solar system formation process," Yeomans said in a prelaunch briefing. The instruments on Contour, he added, will determine the chemical composition of the comet—helping in turn to determine whether a comet might have brought much of the Earth's oceans and its atmosphere, as well as carbon-based molecules, to the Earth's surface.

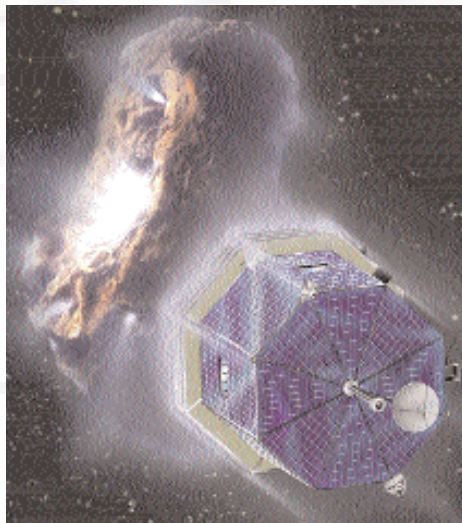
Yeomans said the "genius" of the Contour mission design is that "we're not chasing comets around the solar system; we're using Earth swingbys to allow them to come to us." The encounters are taking place very close to Earth (less than 50 million kilometers or 31 million miles), which, he said, "makes communications easy, but it also allows professional, ground-based astronomers, as well as amateur astronomers and the public, to participate in a very meaningful way." The comets will be bright enough to be seen with binoculars about the same time as Contour is looking at the comet's nucleus, he said.

Members of the JPL navigation team include Tony Taylor, Bobby Williams, George Lewis, Cliff Helfrich, Eric Carranza, Don Han, Ramachand Bhat and Jamin Greenbaum.

The eight-sided, solar-powered craft will fly as close as 100 kilometers (62 miles) to each nucleus, at top speeds that could cover the

56 kilometers between Washington and Baltimore in two seconds. A five-layer dust shield of heavy Nextel and Kevlar fabric protects the compact probe from comet dust and debris.

"Comets are the solar system's smallest bodies, but among its biggest mysteries," said Dr. Joseph Veverka, Contour's principal investigator from Cornell University, Ithaca, N.Y. "We believe they hold the most primitive materials in the solar system and that they played a role in shaping some of the planets, but we really have more ideas about comets than facts. Contour will change that by coming closer to a



comet nucleus than any spacecraft ever has before and gathering detailed, comparative data on these dynamic objects."

Contour's four scientific instruments will take pictures and measure the chemical makeup of the nuclei while analyzing the surrounding gases and dust. Its main camera, the Contour Remote Imager/Spectrograph,

will snap high-resolution digital images showing car-sized rocks and other features on the nucleus as small as 4 meters (about 13 feet) across. The camera will also search for chemical "fingerprints" on the surface, which would provide the first hard evidence of comet nuclei composition.

Encke has been seen from Earth more than any other comet; it's an "old" body that gives off relatively little gas and dust but remains more active than scientists expect for a comet that has passed close to the sun thousands of times. Schwassmann-Wachmann 3, on the other hand, was discovered just 70 years ago and recently split into several pieces, intriguing scientists with hopes that Contour might see fresh, unaltered surfaces and materials from inside the comet.

Contour is the sixth mission in NASA's Discovery Program of lower cost, scientifically focused exploration projects. Johns Hopkins University's Applied Physics Laboratory manages the mission, and also built the spacecraft and its two cameras. NASA's Goddard Space Flight Center provided Contour's neutral gas/ion mass spectrometer and von Hoerner & Sulger, GmbH, Schwetzingen, Germany, built the dust analyzer.

For more information, visit <http://www.contour2002.org>.

Presidential commission visits Lab

JPL Director Dr. Charles Elachi on June 12 hosted the Commission on the Future of the U.S. Aerospace Industry, a group formed in 2001 to study the future of the U.S. aerospace industry in the global economy—particularly in relationship to U.S. national security—and to assess the future importance of the domestic aerospace industry for the economic and national security of the United States.

The commission, which will prepare and issue a final report to the President and Congress no

later than Nov. 27, 2002, is to recommend a series of public policy reforms that will permit the U.S. aerospace industry to "create superior technology, excel in the global marketplace, profit from investments in human and financial capital, benefit from coordinated and integrated government decision-making, assure national security, access modern infrastructure, and give the U.S. a capacity throughout the 21st century

to reach for the stars."

The commission visited JPL to understand the operations of a federally-funded research and development center such as JPL; to understand the relationship between JPL, Caltech and NASA; and to determine how technology developed at JPL is transferred into the private sector.

Elachi took commission members on a tour of several JPL labs and facilities.



Photo by Dutch Slager / JPL Photolab

In the Mars Exploration Rover assembly area, rover system engineer Jennifer Trosper, left, chats with commission members. Next to Trosper is JPL Director Dr. Charles Elachi; from left are Bob Cox, assistant director for reimbursable programs, Earth Science and Technology Directorate; Bob Parker, head of the NASA Management Office at JPL; Commander Sue Hegg, U.S. Navy; Paul Piscopo, committee staff director; Charlie Gordon, commission staff; and commission member and former astronaut Buzz Aldrin.

News Briefs

Science Advisory Group names chair

DR. CAROL RAYMOND, an Earth and planetary geophysicist, has been appointed as the new chair of JPL's Science Advisory Group, which meets quarterly and serves as an important advocate for the JPL scientific and technology research communities.

The JPL Science Advisory Group succeeds a similar body within the Space and Earth Sciences Programs Directorate, which DR. MICHAEL WERNER chaired from 1999 to 2001.

The group reports to JPL Chief Scientist DR. TOM PRINCE. It advises Prince of issues of concern to the JPL research community and work towards their resolution. The group also strives to improve the quality of life for JPL researchers—by publicizing and exploiting existing opportunities and by creating new ones—and invites researchers' participation and input.

The group was instrumental in establishing the EDWARD C. STONE Award for Outstanding Research Publication, and has encouraged the development of a JPL researchers' web page as well as an "Introduction to JPL" course to help new hires get started in the Lab's research environment.

For more information, including membership and meeting minutes, visit <http://div32.jpl.nasa.gov/SAG.html>.

IEEE honors JPLers' research papers

A paper co-authored by DR. MARVIN SIMON and DR. DARIUSH DIVSALAR of Section 331 has been selected as one of the 50 key research papers published by the Institute of Electrical and Electronics Engineers (IEEE) Communications Society society over the past five decades. IEEE is celebrating its 50th anniversary this year.

"Multiple Bit Differential Detection of MPSK," published in the March 1990 issue of the IEEE Transactions on Communications, has been cited more than 65 times in subsequent publications aside from having spawned a number of other research offshoots.

Simon, a JPL principal scientist, has worked at the Lab for 34 years, performing research applied to the design of NASA's deep-space and near-Earth missions resulting in the issuance of nine patents and 23 NASA Tech Briefs. He has published more than 165 journal/conference papers and nine textbooks on subjects dealing with digital communications, and is the recipient of a number of NASA and IEEE awards.

Divsalar, currently a JPL consultant, joined the Lab in 1978 and has developed state-of-the-art technology for advanced deep-space communications systems for future NASA space exploration, with particular emphasis on coding, digital modulation and turbo codes. He has held academic appoint-

ments at UCLA and Caltech, and has published more than 100 papers, co-authored one textbook, and received 20 NASA Tech Brief awards along with seven U.S. patents.

Radio clubs to have a field day

The JPL and Caltech Amateur Radio Clubs will join forces in the annual Field Day activity the weekend of June 22 from atop Mount Gleason. This activity demonstrates radio amateurs' readiness to provide help to the public during times of emergencies, when normal communications services are either out of commission or overtaxed.

The clubs plan to operate seven stations, and the effort will include voice, Morse code, digital and satellite communications. For the first time, tutored operation by non-radio amateurs will be available for those wishing to make few contacts via ham radio.

Mount Gleason is located 30 miles north of JPL by car and can be reached via Angeles Crest Highway.

The public is welcome to the event, said JPL Radio Club member BOB POLANSKY, who urges visitors to bring their camera, as the road offers good photo opportunities.

Operations start at 11 a.m. on June 22 and run for 24 hours. For more information, call Polansky at ext. 4-4940 or JAY HOLLADAY at ext. 4-7758.

CEC enrolling for summer camp, fall

Enrollment is still open for the JPL/Caltech Child Educational Center's Summer Camp. "Exploring Our Natural World," for children completing kindergarten through 6th grade. The program is held June 24–Aug. 28 at three locations: on Michigan Avenue near Caltech, in La Canada at the Oak Grove site near JPL, and at Palm Crest Elementary School. The Oak Grove site will also offer a summer program for children entering kindergarten in the fall. Full summer or weekly sessions are available.

The camp offers swimming, arts and crafts, drama, music, creative writing, sports, gardening, water play, science exploration, and numerous field trips.

In addition, fall enrollment is now open in both the Infant/Toddler, Preschool and School-Age Programs, serving children two months of age through the 6th grade. Initiated by JPL 23 years ago, the center provides high-quality childcare with the fundamental purpose of assisting children in learning to live successful, creative and productive lives.

Tuition assistance is available for qualifying JPL and Caltech families. For more information, to obtain a brochure and application, or to schedule a site visit, call the center at ext. 4-3418 or visit <http://www.ceconline.org>.

Special Events Calendar

Ongoing Support Groups

Alcoholics Anonymous—Meetings are available. Call the Employee Assistance Program at ext. 4-3680 for time and location.

Codependents Anonymous—Meets at noon every Wednesday. Call Occupational Health Services at ext. 4-3319.

Gay, Lesbian and Bisexual Group—Meets the first and third Fridays of the month at noon in Building 111-117. Call the Employee Assistance Program at ext. 4-3680 or Randy Herrera at ext. 3-0664.

Caregivers Support Group—Meets the first Thursday of the month at noon in Building 167-111 (The Wellness Place). Call the Employee Assistance Program at ext. 4-3680.

Working Parents Support Group—Meets the third Thursday of the month at noon in Building 167-111 (The Wellness Place). For more information, call the Employee Assistance Program at ext. 4-3680.

Friday, June 21

Von Kármán Lecture Series—JPL's Dr. Don Yeomans, head of NASA's Near Earth Objects Program Office, will present "Comets, Asteroids and the Interplanetary Shooting Gallery" at 7 p.m. in Pasadena City College's Vosloh Forum, 1570 E. Colorado Blvd. Yeomans will discuss how comets and asteroids may have brought the building blocks of life to the young Earth and later caused worldwide extinctions. For more information, call Public Services at ext. 4-0112.

Saturday, June 22

CEC Wine-Tasting Benefit—The Child Educational Center's annual fundraiser will be held from 6:30 to 11 p.m. at Caltech's Avery House. Enjoy fine wines, great food, unique auction items, gaming and live music from the Chad Edwards Quartet. Admission is \$30, with special Connoisseur Table tickets at \$60, which includes 10 tastes of premium wines along with knowledgeable

information and the finer points of wine tasting. Tickets are available at the JPL Store, Caltech Book Store or CEC office, and may be purchased at the door the evening of the event for an additional \$10 per ticket. For more information, call ext. 4-3418.

Tuesday, June 25

Investment Advice—One-on-one counseling is available with Fidelity Investments in T1720-131. For an appointment, call (800) 642-7131.

Wednesday, June 26

JPL Toastmasters Club—Meeting at 5 p.m. in the 167 conference room. Guests welcome. Call Joy Hodges at ext. 4-7041 for information.

Thursday, June 27

Caltech Architectural Tour—The Caltech Women's Club presents this free service, which is open to the public. The tour begins at 11 a.m. and lasts about 1 1/2 hours. Meet at the Athenaeum front hall, 551 S. Hill St. Call Susan Lee at (626) 395-6327.

JPL Golf Club—Meeting at noon in Building 306-302.

Saturday, June 29

Folk Music—Irish quartet Téada will appear at 8 p.m. in Caltech's Dabney Lounge. Tickets are \$12 for adults, \$4 for children under 12. For information, call (626) 395-4652 or visit <http://www.cco.caltech.edu/~folkmusi>.

Tuesday, July 2

JPL Gamers Club—Meeting at noon in Building 301-227.

JPL Genealogy Club—Meeting at noon in Building 301-271.

Wednesday, July 3

Associated Retirees of JPL/Caltech—Meeting at 10 a.m. at the Caltech Credit Union, 528 Foothill Blvd., La Cañada.

Ongoing

Social Security—Call the Benefits Office at ext. 4-3760 for an appointment with a representative in July.

Seven JPLers win SFA honors

Seven JPL employees earlier this month received NASA's Space Flight Awareness award, earning a trip to Kennedy Space Center for the scheduled June 5 launch of Space Shuttle Endeavour.

Honorees, in photo below, left to right (front row): Katherine Levister, Chau Buu; back row: Jan Martin, Eric Gurrola, Astronaut Mark Kelly, Jerry Clark, Wolfgang Fink, Son Ho, along with guest John Beckman, Engineering and Science director, received a VIP tour of KSC as part of the award. Unfortunately, weather conditions delayed the launch of the shuttle.

At JPL, the Space Flight Awareness Program is administered by the Employee Services and Recognition Group. For more information, visit <http://eis/sec614/reward/#sfa>.



Prince to discuss new research and technology program June 27

JPL Chief Scientist Dr. Tom Prince will discuss the Laboratory's new Research and Technology Development Program at an all-hands meeting Thursday, June 27, from 9 to 10 a.m. in the Building 167 conference room. The presentation will also be webcast at <http://dailyplanet>.

In concert, Prince has issued a call to solicit strategic research proposals. Approximately \$2 million to \$2.5 million will be reserved for proposals of less than \$150,000. Proposals for funding in excess of this amount must be coordinated with the relevant technical division(s) and program offices. Proposals can range up to \$1 million.

Proposals are sought in the areas of basic research, applied research, development and systems and other concept formulation studies. For information on the strategic focus areas that must be addressed within the proposals, as well as constraints and requirements, log on to <http://rtd.jpl.nasa.gov/call03.html>. Full proposals are due Friday, July 26.

The main purpose of the Research and Technology Development Program, Prince announced this week, will be to enhance JPL's ability to address the future objectives and missions of JPL and NASA consistent with the strategic direction and long-term vision.

For questions, e-mail Katherine.A.Dumas@jpl.nasa.gov.

Correction

An article in the June 7 issue of Universe on visiting students creating "ice cream comets" should have indicated that the outreach effort was sponsored by the Deep Impact mission, not by Stardust.



**X-band antenna will track
space observatory
following January launch**



SIRTF *will* PHONE HOME *from* SOUTH AFRICA

By Charli Schuler

IMMEDIATELY AFTER the JPL-managed Space Infrared Telescope Facility launches from Kennedy Space Center, Fla., in January 2003, mission planners anticipate a four-hour communication gap when their tracking system won't be able to "talk" to the observatory. This could be a nerve-wracking time for those who have worked so hard on the mission, an infrared telescope that will study the early universe, old galaxies and forming stars, and detect dust disks around stars where planets may be forming.

The solution to their problem lies within the Council for Scientific and Industrial Research Satellite Applications Center, a satellite tracking facility in South Africa formerly used by NASA. Located in Hartebeesthoek, 60 kilometers (37 miles) north of Johannesburg, the Satellite Applications Center will track the spacecraft for up to four hours, or until the Deep Space Network's tracking station near Madrid, Spain, acquires a signal.

"No one wants to sit on pins and needles for four hours," said Pat Beyer, telecommunications and mission systems manager for the Space Infrared Telescope Facility at JPL. "So we contracted with Hartebeesthoek, which has a smaller antenna that can't track in deep space as well, to fill in the gap."

The Deep Space Network is an international network of antennas that supports interplanetary spacecraft missions. The network has three tracking stations: at Goldstone, Calif., in the Mojave desert; at Robledo de Chavela, Spain, 60 kilometers (37 miles) west of Madrid; and near the Tidbinbilla Nature Reserve, 40 kilometers (25 miles) southwest of Canberra, Australia.

The Satellite Applications Center in South Africa uses smaller antennas than the Deep Space Network. The larger the antenna, the better the ability to track objects in deep space. The Space Infrared Telescope Facility will use the South African facility's 5.4-meter (18-foot) and 12-meter (39-foot) antennas.

The Deep Space Network antennas being used measure 34 and 70 meters (111 and 230 feet). Deep Space Network facilities can track spacecraft traveling more than 16 billion kilometers (10 billion miles) from Earth.

The Deep Space Network tracking facilities use antennas that continuously compensate for the Earth's rotation. Once a spacecraft reaches space, it does not rotate with earth, but at its own pace. A spacecraft is only in the "line of sight" with one facility for a maximum of 10 to 12 hours a day before being handed off to another facility.

"The Space Infrared Telescope Facility is a different animal than we've dealt with in the past because it's an observatory, not an orbiting planetary mission," Beyer said.

Normally, when a spacecraft launches, it travels through the sky in a southeast direction, from Kennedy Space Center to Canberra. But the Space Infrared Telescope Facility will move so slowly in this direction that the rotation of the Earth will overtake it. Its resulting course will veer to the west before reaching Australia. The Madrid tracking station will not be able to track the observatory until after four hours have elapsed.

The Space Infrared Telescope Facility is the first new mission of NASA's Origins Program, which strives to answer the questions "Where did we come from?" and "Are we alone?" It is also the fourth and last of NASA's Great Observatories, a program that also includes the Hubble Space Telescope, the Chandra X-Ray Observatory and the Compton Gamma Ray Observatory.

"In the field of astronomy and physics, it is always inspiring for people to discover phenomena that will help us explain why we are here and how the solar system evolved," said Johnny Kwok, mission design manager for the Space Infrared Telescope Facility. Kwok developed the mission concept for the spacecraft, including what the spacecraft has to do, the path it has to take, and how it communicates

information back to Earth. "With the Space Infrared Telescope Facility, we can look back in time and study the history to this early formation of the universe. That's exciting, and it satisfies our curious nature."

During its 2.5-year mission, the Space Infrared Telescope Facility will obtain images and spectra by detecting the infrared energy, or heat, radiated by objects in space between wavelengths of 3 and 180 microns (1 micron is one-millionth of a meter). Most of this infrared radiation is blocked by the Earth's atmosphere and cannot be observed from the ground.

Consisting of a 0.85-meter telescope and three cryogenically-cooled science instruments, the facility will be the largest infrared telescope ever launched into space. Its highly sensitive instruments will provide a unique view of the universe and allow scientists to peer into regions of space that are hidden from optical telescopes. Many areas of space are filled with vast, dense clouds of gas and dust which block the view from Earth. Infrared light, however can penetrate these clouds, allowing a view into regions of star formation, the centers of galaxies, and into newly forming planetary systems. Infrared also provides information about the cooler objects in space, such as smaller stars that are too dim to be detected by their visible light; extrasolar planets; and giant molecular clouds. Also, many molecules in space, including organic molecules, have their unique signatures in the infrared.

As for preparations for the mission's launch, the Space Infrared Telescope Facility on June 17 began about four weeks of thermal vacuum and thermal balance testing to ensure that it will function properly in a space environment. Afterward, it will undergo about two months of mission scenario testing, which will determine how well the observatory can operate in flight. The observatory's software and hardware must work together with ground operation commands before it can be shipped to Kennedy Space Center in late November. Once at the launch site, engineers will spend 45 days making sure the facility functions properly after the move, and preparing for the launch.

At top, from left: artist's rendering of the Space Infrared Telescope Facility; an image, taken last month at Lockheed Martin in Sunnyvale, Calif., showing SIRTF's newly-attached solar array integrated with the rest of the observatory; the X-band antenna that will track SIRTF following launch as it flies over South Africa. Bottom image shows the Satellite Applications Centre, Hartebeesthoek, South Africa.



Enjoying a rare sight



Photo courtesy of Andrea Domellian



Children at Woodbury Village Preschool, left, got a chance to view the rare solar eclipse

June 10 with the help of JPL's Telescopes In Education project, which also brought telescopes to the Child Educational Center and the Five Acres Boys and Girls Home. Meanwhile, astronomer Jim Young of JPL's Table Mountain Observatory offered this image of the eclipse, as photographed from the Wrightwood facility with a 10-inch, full-aperture filter.

Passings

VIRGINIA LANE, 92, a retired JPL employee from the former Section 710, died May 7.

Lane joined JPL in 1969 and retired in 1977. Services were private.

KURT CARTER, 47, an electronics technician in Section 335, died of a heart attack May 12.

Carter had worked at JPL since 1991. He is survived by his wife, Helene.

A memorial service will be held in von Kármán Auditorium July 24 at 11:45 a.m.

FREDERIC BILLINGSLEY, 80, a retired member of the technical staff in Section 384, died of respiratory failure May 31.

Billingsley worked at JPL from 1962–91. He is survived by his wife, Evelyn, three children and seven grandchildren. Services were private.

DR. NASSER GOLSHAN, 59, Division 33 representative the Deep Space Mission Systems' Engineering Program Office, died of a brain aneurysm June 6. Golshan had worked at the Lab since 1989. He is survived by his wife, Maryam-Mahtash Esfandiari, and sons Hooman and Ali.

Memorial services were held at Westwood Memorial Park.

SHARON BARR, 33, a staff engineer in Section 313, died June 12.

Barr had worked at JPL since 1994. She is survived by her husband, James, and daughter Jessica.

Services will be held June 24 at 11 a.m. at Rose Hills Memorial Chapel in Whittier.

Letters

Thanks to all of the people at JPL who have offered kind and thoughtful words, written cards, or sent me a plant after the passing my father. Your condolences during this time of mourning was a much-appreciated comfort for me and my family. Thank you.

Matthew Bennett

I would like to thank my colleagues and friends both at JPL and at LMA, for their support and kindness following the recent death of my father. I would like to thank JPL for the gift of a beautiful plant, which we will care for in his memory.

Todd Bayer

Classifieds

For Sale

BABY ITEMS: Evenflo carrier, soft front, \$7; Century carseat w/base, rear facing, \$40; Safety1st bathtub carousel, \$7; all in superb cond., prices are obo. 626/791-6101.

BABY ITEMS: Bellini crib & matr., white, \$300; Bellini changing table/hutch, 3 drawer, \$300; jogger, \$100; all in exc. cond., prices are obo. 626/351-1131.

BED, antique oak & rod iron, queen-size, w/rails, picture at JPL Store, \$150/obo. 626/744-9064. BICYCLE, women's, 29" Centurion Comp TA road bike, equipped with Shimano 600 derailleur, etc, terrific cond., \$60. 956-3745. Steve.

CAMCORDER, Sony Hi-8, model: CCD-TR81, remote, carry case, 8 blank tapes, works well, \$175/obo. 687-8627.

CAMERA, Mamiya M645 SLR, A & E prism, 220 back, w/120 & 220 roll film holders and inserts, deluxe power motor dr. lenses, 45 mm, 80 mm & 105-210 zoom, Sumpak auto flash, mod. 555, aluminum case, \$2,200. 323/257-7668.

COFFEE MAKERS: both 10-cups, like new; Krups, white/gray, \$40/obo; Braun, white/black, \$30/obo. 626/791-6101.

DINETTE SET, round table, four chairs, 2 ext. to make table oval, \$75. 626/355-2957.

EXERCISE EQUIPMENT: treadmill, \$75, Cardio-glide, \$50; DINING TABLE, round with four swivel chairs, leather upholstery, \$100. 626/447-6423.

FISH TANK, 40 gal., new stand, heater, pumps & other accessories, must sell, \$173/obo. 626/405-9701, leave msg.

METAL DETECTOR, for door security, Garrett, includes battery kit, earphone, belt loop and holder, 100/ea. picadogeorge@hotmail.com.

MOVING SALE: typewriters, 2, antique, \$50/ea.; hammock, enormous, white nylon, \$75; Sony dual tape cass. player, \$50; Martin 00016 acoustic guitar, \$800/firm; NordicTrack skier, \$100/obo; Mini tape recorder, like new, \$15. 626/577-0778.

POOL TABLE, 8 ft. w/Slatron bed, like new, only 6 mo. old, brass light bar w/4 red shades, 10 cue corner rack holds balls, drinks, and talc, comes w/spill proof table cover, balls, 2 cues, 8 ball and 9 ball racks, \$900/obo. 626/405-9701, leave msg. REFRIGERATOR, off-white 18 cu. ft. Kenmore Goldspot, less than 1 yr. old w/1 year of warranty remaining, avail. Aug., \$400/obo. 626/289-6359.

REFRIGERATOR, narrow, about 4' tall, 22" wide, 7.1 cu. ft., excellent space saver, \$75. 957-7742. SCANNER, brand new Memorex 6142u color flat-bed, never been used, 600 x 1200 dpi, supports Windows 98/2000/ME, 9600 dpi enhanced resolution, \$37. 956-3745. Steve.

SKI SET, used women's, Head 170s, Gala Radial & poles, Salomon boots, size 7, plus bindings, see picture at JPL Store, \$150/obo. 626/744-9064.

SOFA & LOVE SEAT, never used, \$425. 957-3675. SOFA SLEEPER, makes into queen sized bed, abstract black, blue and mauve color design, good cond., \$300; BICYCLES, 4, children, \$15/ea.; LADDER, \$50. 626/357-8210.

TRIPOD PROJECTION SCREEN, Da-Lite Versatol, portable, white, 60 in. x 60 in., very good cond., hardly used, \$60. 626/398-9702, Tom.

WEIGHT BENCH, adjustable, Marcy Brauny Plus, padded weight bench with leg lift, adjustable incline bench, adjustable barbell rack-both height and lateral extension, high density foam padded, very good cond., \$50. 626/398-9702, Tom.

Vehicles/Accessories

'98 AUDI A4, 6 cyl., off-white, sunroof, concert sound syst., 22K mi., immac. cond., \$18K. 793-2611.

'00 BMW Z3, 2.8, 5 spd., under 35K mi., custom lthr. inter'r, impeccably maint., silver/ black top, drives like "the ultimate driving machine," serious drivers only, low Blue Book, \$30K. 323/550-1150.

'02 CHEVROLET Avalanche 1500, 2 w/d, V8, 4 spd. auto., 6,300 mi., loaded, + Star, Lo-Jack, running boards, \$28,900. 779-8481, George.

'99 CHEVROLET Silverado LS15, auto V8 4.8L eng., 2 dr., black, stainless wheels, brand new tires, Rhino bed liner, Snug Top tonneau, cloth interior, AM/FM/CD, power accessories, exc. cond., 22,000 mi., \$14,500. 626/792-7753, after 5 pm.

'94 CHEVY Astro cargo van, V6, auto. trans., a/c, ps, pb, airbags, ABS, am/fm stereo, cust. whls., exc. cond., new paint/tires/shocks/brakes, Cargo King bedliner, all records, 125K mi, see http://www.stonehillnews.com/astro, \$5,155/obo. astro@stonehillnews.com, 626/399-6276, Jeremiah.

'94 CHEVROLET Camaro, V6, Bose stereo speakers, pwr. windows and driver's seat, teal, 116K mi., exc. cond., \$6,000. 833-7107.

'99 DODGE Ram 1500 truck, 5.2L V8, 8' bed, locking shell, 41K mi., must sell, \$12K. 909/593-6379, eves.

'97 DODGE Caravan, 7 pass., 4 cyl, a/c, pwr. steering, dual airbags, dk. green, 2nd owner, exc. cond., sold because moving out of U.S., 76K mi., \$6,000. 626/795-2409.

'98 FORD Ranger XLT, great cond., wht., 2 dr., V6, 4.0, 83K mi, 6" body lift, off road tires, custom brush guard, pwr everything, a/c, ABS, am/fm/ cass., bedliner, tow hitch, spotlight, code3media@crowncv.net for photos, \$13,000/obo. 822-6465.

'98 FORD Windstar GL, 7 pass, a/c, pwr. steering, dual airbags, dark green, 2nd owner, exc. cond., sold because moving out of US, 93K mi., \$9,800. 249-0909.

'96 FORD Escort LX, 2 dr. hatchback, stick shift, a/c, stereo, only 60K mi., great commuter car, exc. cond., \$4,350. 909/985-6806.

'95 FORD Windstar XL minivan, rear air, quad seating, console, plus many more features, 87K mi., one owner with all records, runs great, \$5,700. 626/447-6423.

'87 FORD F150, black, V8, 5.0, a/c, power doors/windows/brakes, auto, cruise control, 1/4 cab & bedliner, towball, wiring, HD springs, good cond., \$3,100. 951-3653.

'67 FORD Mustang, candy apple red, exc. cond., good exterior, still needs work, newly painted, re-built 302 eng., power steering, put in front disk brakes, orig. 8-track stereo, 3rd owner, have all the work receipts, \$9,000/obo. 954-0269, Dustin.

'00 HONDA Civic, silver, 38,1K miles, 5ps, a/c, PS, AM/FM radio, immaculate, always dealer serviced, service docs, great fuel mileage, \$10K/obo. 243-1780 or armond@sprintmail.com.

'98 HONDA Civic LX sedan, white w/gray cloth interior, 47K mi., automatic, power brakes/door

locks, AM/FM stereo, a/c, tilt steering, cruise control, tinted glass, driver and passenger side airbag, deluxe wheel covers, rear defroster, one owner, great cond., \$10,700/obo. 956-8060.

'94 HONDA Nighthawk, 250cc, 2,500 miles, exc. cond., kept in garage, \$2,000. 562/693-1136.

'93 HONDA Accord EX sedan, 4 dr., automatic, am/fm cass., sunroof, black, clean, 96,000 mi., \$7,300/obo. 244-3343.

'81 HONDA Interstate SilverWing, shaft drive, water-cooled, Prolink suspension, just over 6K miles, garage kept, near mint, incl. 2nd seat for passenger, http://home.attbi.com/~macmaven/sw/index.htm for pictures, \$2,250. 353-2103.

'99 JEEP Wrangler SE, exc., black, soft top, under 23K miles, 4 wheel drive, extras, like new, \$11,000. 957-7742.

'93 KAWASAKI Ninja, 600cc, great cond., black with turquoise/purple stripe down the side, leather tank cover, 16K mi., see picture at JPL Store, \$3,200/obo. 501-8161.

'94 MAZDA MX-3, silver, auto, a/c, Pioneer CD, 2 dr., 4 seater, Blue Book value \$3,000, sell for \$2,000. 213/280-5425, cell.

'93 MAZDA MX6, red w/tan interior, 5-spd., sunroof, alarm, new CD player, pwr. windows/ locks, a/c, 115K miles, vg cond., \$3,900. 323/221-9691.

'93 NISSAN Altima GXE, dk. blue, 67K mi., new tires, 4 door., a/c, pwr. windows/locks/steering, airbag, 1 owner, vg cond., \$3,800. 952-6214.

'86 SUZUKI GSX-R 750 motorcycle, very low mileage with some engine work, in great shape and lots of extras, \$2,500. 640-7479, Greg.

'94 TOYOTA Tercel DX sedan, 4 dr., auto., a/c, pwr. steering, AM/FM stereo, 118K mi., gd. cond., \$3,400. 661/259-5971, cuihyeok@netzero.net.

'98 TOYOTA Camry LE, exc. cond., automatic, a/c, power locks/windows, sage, 13 mo. of warranty remaining, 63,000 mi., Blue Book value, \$12,960. 626/797-6388.

Wanted

DONATED ITEMS, for Amnesty International Pasadena/Caltech Group 22 summer sale, household goods, clothes, toys, electronics, furn., all proceeds for human rights activities. aigp22@caltech.edu.

HOUSING, webmaster seeks extr. priv., quiet think tank, willing to pay rent, barter goods/ services or housesit for free. 248-6062, Elizabeth.

MINI-BIKE, Rupp, in running cond. 626/357-7347.

MOTOR HOME, to rent July 24-26. 661/290-2892 or 818/249-2235.

SPACE INFO/memorabilia from U.S./other countries, past & present. 790-8523, Marc Rayman.

VOLLEYBALL PLAYERS, coed, no beginners please, Tues. nights 8-10:00 at Eagle Rock High School, \$3/nt. 956-1744, Barbara.

WOOD LATHE, med. to heavy duty. 323/662-4089.

Free

COMPUTER CASES, old, with (non-ATX) power supplies and miscellaneous other 386/486 hardware for hobbyist. 626/794-9579, eves.

KITTENS, four, 2 tabby, 2 black, very friendly, litter trained, healthy, 16 wks old. 626/287-9433.

MULCH, for weed control & composting, Fire Dept. approved, great in gardens, builds healthy soil, reduces water consumption, free delivery to local area, have tons. 626/798-6405, after 6 p.m.

For Rent

ALTADENA, charming studio above garage with spacious closet area, bathroom, kitchen facilities; quaint foothill neighborhood, 4 miles from JPL; beautiful grounds, with friendly dog; \$695, incl. utilities; avail. July 1. 626/797-2999.

ALTADENA house, 3 bd., 1 ba., hardwood floors, remodeled kitchen, new tile, fireplace, swimming pool, \$1,600. 626/437-3691.

ALTADENA, charming, freshly painted 2 bd., 1 ba., house, nr Christmas Tree Lane, hardwd flrs., fireplace, appliances, whole-house fan, fenced backyard, fruit trees, roses; see www.alumini.caltech.edu/~chrisc, rent \$1,650/negotiable, includes water, gardener, trash. 626/794-9579, eves.

ALTADENA, 3 bd., 2 ba., private family home, fireplace, remodeled kitchen and bath, 2-car garage, laundry, spacious back yard, great view, gardener included, \$1,500. 909/392-7554.

ALTADENA, studio apt. with kitchenette, 3 mi. from JPL, \$550. 626/797-6287.

ALTADENA, room, kitchen privileges, washer/dryer, swimming pool, \$400. 626/345-0692 or 626/437-3691.

LA CANADA/FLINTRIDGE, private room, private ba., kitchen privileges, BBQ, pool, parking, 2 mi. from JPL. 952-5430.

LA CRESCENTA house, extra nice, 2 bd., 1 ba., fireplace, 5 min. from JPL, central heat, formal dining room, water and gardener inc., no smoking or pets, \$1,550. 805/659-1742.

LA CRESENTA, apt. to share, 2 bd., 1 ba, washer/dryer, 15 mins./JPL, no smoking or pets, female preferred, avail. 7/1, \$425 + 1/2 util. 249-9739.

MONROVIA studio, off-st. parking, incl. water/trash, no smoking/pets, carpet, blinds, stove, gardener takes care of lawn, avail. 7/7, month-month, \$600 + \$500 sec. dep. 714/839-5705.

MONTROSE guesthouse, studio w/full ba., full kitchen, quiet, private, walk to Montrose Village, \$625 includes utilities. 957-4812.

PASADENA, spacious 2-story condo, 3 bd., 2.5 ba., prestigious community, beaut. inter., bright ktch., prof. landscape, ctrl. air/heat, close to shop/schls., cozy 1/2 w/FP, end unit, frml. d/r, hd-wd. flrs., immac. cond., \$1,750. 626/396-9024.

PASADENA condo, walk to S. Lake & Old Town, 2 bd., 2 ba., cent. air, secured bldg., underground parking, lg. balcony, \$1,350. 626/826-9868.

Real Estate

COLORADO, 10+ level acres near Rio Grande, NM border, 2 adjacent 5-acre lots on St. Hwy 248, sell one or both for \$1K/acre/obo. 626/254-1550.

GLENDALE, 4 bd., 2.75 ba., 2,410 sq. ft. home, pristine move-in cond., convenient 10 min./JPL, wooded Glenoaks Cyn., wonderful neighb'h'd, bay-windowed living rm w/lpl, formal dining rm, lg. fam rm w/wet bar, & remod. oak-cab kit, spacious front porch w/cyn view, incl. kitchen & laundry

appl., new carpet/paint/lighting/furnace/dbl-pane windows, Cu plumbing, \$529K. 323/937-9349.

MONROVIA, character California bungalow, walk to Old Town, 3 bd., 1.75 ba., on a large lot with lots of fruit trees, dining room with built-in wood cabinets, updated kitchen, \$295,000. 952-6007.

SHOW LOW, Ariz., 3 bd. house, .43 acres w/ ponderosa pines, nat'l gas, sewer, in town subdivision, close to skiing and fishing, great investment property, house nds. help. \$25K/obo. Randall.Mielke@fijivillage.com.

WILLIAMS, Ariz. area, (10 mi. away), 43 acres w/ 2-rm house, seasonal pond, wildlife everywhere, house on top of cliff w/ great views, \$34K, adjacent 41 acres available w/ great building site on cliff edge, \$22K.

Randall.Mielke@fiji.com.

Vacation Rentals

BIG BEAR LAKEFRONT, luxury town home, 2 decks, tennis, pool/spa, beautiful master bd. suite, sleeps 6. 949/786-6548.

CAMBRIA, ocean front house, sleeps up to 4, exc. view. 248-8853.

CANCUN, timeshare condo (A Royal Resort), July 6-13, sleeps 6, 2 bd., 2 ba., on the North Shore, full kitch., resort offers restaurants, bars, mini-market, 2 pools, tennis, bicycles, sailboats, 18-hole golf course nearby, \$500/wk. 805/577-0990.

HAWAII, Kona, ocean front on Keauhou Bay, house and guest house comfortably sleep 6, 3 bd., 2 ba., rustic, relaxing and beautiful, swimming, snorkeling, fishing, spectacular view, near restaurants, golf and other attractions. 626/584-9632.

HAWAII, Maui condo, NW coast, ocean front view, 25 ft. fr. surf, 1 bd. w/loft, compl. furn. phone, color TV, VCR, microwave, d/w, pool, priv. lanai, slps 4, laundry fac., 4/15-12/14 \$105/nite/2, 12/15-4/14 \$120/nite/2, \$15/nte/add'l person. 949-348-8047, e-mail jackandrandy@cox.net.

MAMMOTH, Courchevel, fully equipped unit, 2 bd., 2 ba., sleeps 6, a short walk to Canyon Lodge and ski lifts. 661/255-7958.

MAMMOTH, Snowcreek, 2 bd., 2 ba., + loft, slps. 6-8, fully equip'd kitch. incl. microwave, D/W, VCR, cable TV, phone, balcony w/mtn. vw., Jacz., sauna, streams, fishponds, close to Mammoth Creek, JPL discount. 626/798-9222 or 626/794-0455.

OCEANSIDE condo, fully furn., 2 bd., 2 ba., fire-place, full kitchen, quiet, relaxing, beautiful beachside setting, BBQ, pool, spa, game room, great ocean view, easy walk to pier and restaurants, sleeps 8, avail. weekly or monthly. 909/981-7492 or dfhaug@yaho.com. Darlene.

OCEANSIDE, on the sand, charming 1 bd. condo, panoramic view, walk to pier & harbor, pool/spa, game rm., sleeps 4. 949/786-6548.

PACIFIC GROVE hse, 3 bd., 2 ba., f/p, cable tv/vcr, stereo/CD, well eqpd. kit w/microwv, beaut. furn, close to golf, beaches, 17 Mile Dr., Aquarium, Cannery Row, JPL disctn. 626/441-3265.

PUEKTO VALLARTA, Villa del Mar, lg. studio, sleeps 4 max, rooms have microwave, kitchen, phones, cable TV, priv. patio, 3 pools, 3 res-taurants, spa, priv. beach, charming town, top rated resort, avail only 12/28/02 - 1/4/03, on-site New Year's Eve Fiesta, see at http://www.myuvc.com/puerto_vallarta.shtm. 541-1340.

ROSARITO BEACH condo, 2 bd., 2 ba., ocean view, pool, tennis, short walk to beach on priv. rd., 18-hole golf course 6 mi. away, priv. secure parking. 626/794-3906.

SILVERLAKES, Calif., resort, golfer's dream, 4 wks free golf each year at private PGA-rated course w/driving range/putting greens, vac. club membership, 2-bd. condo for up to 6, 2 lakes, many amenities, less than 2 hrs. from Pasadena, exchange rights w/3,000 resorts, reduced to sell due to illness, \$15,000. 805/967-7725.